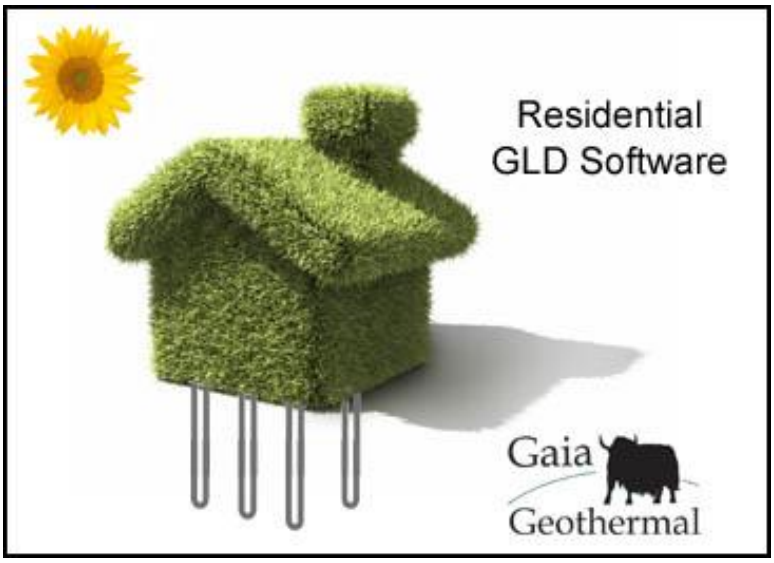
Tutorial

Ground Loop Design

Residential Version 5.1 for Windows



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Ground Loop Design™ Residential Version 5.1 Tutorial

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NOTE: To start designing immediately, begin at STEP 1 and continue through STEP 7.

Chapter 1

Welcome To Ground Loop Design Residential

Welcome to Ground Loop Design (GLD) Residential Version 5.1, Gaia Geothermal's residential ground source heat pump system design software. GLD offers designers a suite of rapid, user-friendly, customizable and accurate design optimization tools. With GLD, designers spend less time designing and more time offering competitive proposals, installing systems, and satisfying customers. GLD works in conjunction with the GeoXergy Plug-In to provide a full set of design tools including loads calculations, energy analysis and cost comparison, cash flow payback, and a greenhouse gas emissions reduction calculator. See the GeoXergy Plug-In documentation for more information.

As you progress through this Tutorial in the next 15 minutes, you will create your first design and also will learn how GLD can help you design faster and more effectively. Thank you for your interest in GLD Residential. We think you will enjoy the program.

New in Version 5.1

Ground Loop Design Residential Version 5.1 adds a range of features to the program including:

- **fixed temperature and fixed length design modes** in the borehole design module. In fixed temperature mode, designers specify inlet temperatures and the program calculates bore lengths. In fixed length mode, designers specify a loopfield length (*borehole length* x *number of boreholes*) and then have the program calculate heating and cooling inlet temperatures

GLD Features

FULL POWER

3 Types of Heat Exchangers	**Loads Inputs**
Vertical • **H**orizontal • **S**urface **W**ater	**Z**one-by-**Z**one

The Residential version of Ground Loop Design includes three design modules: one for vertical borehole, one for horizontal and one for surface water (pond, lake, etc.) installations. GLD also includes the zone loads module for detailed zone-by-zone loads. The loads module can be used to manually or automatically select from hundreds of included **water-to-air** and **water-to-water** heat pumps. The loads data can be shared between modules using Ground Loop Design's unique linking system. In addition, data from external loads programs (such as the GeoXergy Plug-In) as well as from Excel files can be imported conveniently into the loads modules.

COMPLETE CUSTOMIZATION

Data **S**heets • **R**eports • **H**elp **F**iles

Because of the extensive customization and override features included in the software, Ground Loop Design is suited ideally for both standard and non-standard applications (which can involve significant variations in equipment, loads, and operational parameters for each zone in the design). The user, who may prefer to add his or her specific images or data sheets, has the freedom to customize the data reference files.

EFFECTIVE COMMUNICATION

English **U**nits • **M**etric Units • **Pro R**eports • **M**ultilingual

With instant, direct metric/English unit conversions and foreign language capabilities, Ground Loop Design is a truly international program. With Ground Loop Design, communicating project parameters, equipment requirements and loads data with coworkers, partners, and vendors anywhere in the world is efficient and easy. Furthermore, after designing a project, it is effortless to email the small project and zone files to colleagues.

Why This Tutorial?

The primary purpose of this tutorial is to show you how to design quickly and effectively with GLD. To meet this goal, this tutorial will take you step-by-step through the design of a vertical borehole heat exchanger for a mid-sized residence.

- In chapter 2, you will discover how easy it is to import loads into GLD. Next, you will learn how to match the pumps to the loads using GLD's automatic and manual pump selection options.

- After mastering the loads side of the program, you will look at the heat exchanger side. In Chapter 3 you will design a vertical borehole system for the project using the loads data we import in Chapter 2. You can explore the horizontal design module and surface water module on your own.

- In chapter 4, you will learn how to print out professional reports that are as impressive as your designs. The guide concludes with a series of tips that will help you take full advantage of the program.

The secondary purpose of this tutorial is to introduce you to some of the more advanced features of the program. A complete description of the program can be found in the full User Manual.

The following icons appear throughout the guide:

STEP 1

This icon appears in the left margin of this guide at the beginning of every major step in the design process. If you want to focus your time mainly on learning how to design, just follow these icons step-by-step through the sample design.

This icon appears in the left margin when this guide offers more detailed information about GLD

See the full user manual for installation and license dongle information.

Chapter 2

Loads And Pumps

Ground Loop Design Residential Version 5.1 is designed for residential applications and has a maximum peak load design capacity of 200 kBtu/hr. Systems with peak loads that are greater than 200 kBtu/hr fall into the realm of commercial systems and generally require more advanced heat transfer models that take long-term thermal effects into account. Additionally, larger residential systems oftentimes have internal heat gains and losses (from media rooms, pools, etc), and therefore, loads for such systems should be modeled using more advanced methods to ensure optimal system design. If your peak load is 200 kBtu/hr or greater, consider upgrading to Ground Loop Design Premier Version 5.1, a software suite that provides significantly enhanced capabilities and features. Regardless of the project type, note that the results that GLD calculates are only as good as the information that the designer inputs. It is ultimately the designer's responsibility to confirm that input values are reasonable.

Loads Module Introduction

GLD Residential Version 5.1 provides users with the flexible and powerful Zone Manager Loads module. For small installations, the entire loads can be entered into a single zone. For larger installations, designers can take advantage of the more advanced program features by entering loads on a zone-by-zone basis, and then matching pumps to loads/zones in an automatic or manual fashion (water-to-water and water-to-air pumps are both available in the program).

What Loads Data Does GLD Need?

Designers need the following data to begin using the program. Note that the more detailed the loads data are, the more accurate the final design will be.

Minimum Loads Data Requirements:

- Peak hourly heating and peak hourly cooling loads (in kBtu or kWh)
- The Annual Running Time (0-100%)

Two ways to Calculate the Annual Running Time:

1. Sum the total cooling loads for the year. Divide the sum by the peak hourly cooling load to get a result with units in "hours." Divide the result by the number of hours in a year (8760). The resulting percentage is the annual running time.

Example:

Total annual cooling kBtus: 18500 kBtu

peak: 22 kBtu/hour

18500 kBtu/ 22 kBtu/hour =841 hours

841 hours/8760 hours/year = 9.6% annual running time.

Repeat for heating loads

2. For cooling, if the system were running at peak capacity, how many hours would it have to run for in order to take care of the cooling loads for the entire year? After determining the answer, divide it by 8760 to get the annual running time percentage.

Repeat for heating loads.

GLD uses these loads data both to match pumps to loads and to determine the appropriate length of the heat exchanger. The mathematical models that GLD uses are described in detail in the full User Manual.

Where Can I Get The Loads Data?

GLD users oftentimes get their loads data from residential loads (heat gain/heat loss) calculation programs such as the GeoXergy Plug-In. These programs often output data into Excel (or are Excel worksheets themselves), and from Excel it is straightforward to copy and paste the data into GLD. This process will be explained below. Remember that GLD outputs good results only when the user inputs good loads data.

How Do I Get The Loads Data Into GLD?

After calculating or receiving the appropriate loads data, there are two easy ways to get the data into GLD:

- GLD can import the loads data from an Excel spreadsheet *provided that the loads data follows a prescribed format* (more on this below)
- GLD can accept input directly into the loads screen text boxes

Both of these methods are explained below. **For the demonstration project, we will follow the first method.**

Step 1

Importing Loads Data From Residential Loads Analysis Programs: the GeoXergy Plug-In

STEP 1.0

For the demo project, we will import the loads data from the GeoXergy Plug-In. Open up the GLD program.

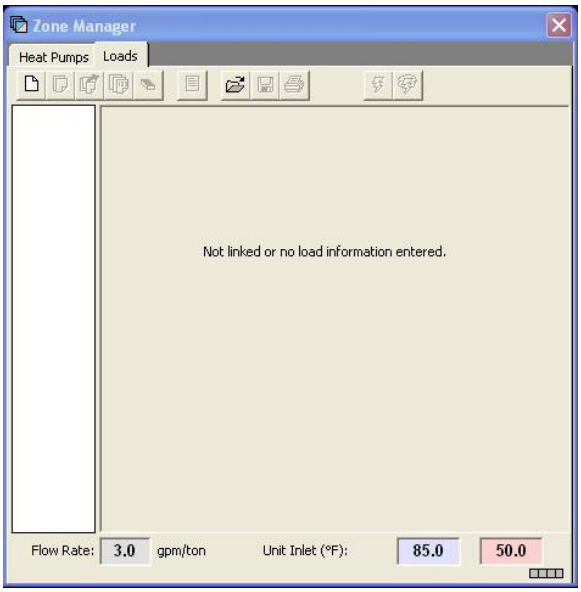
STEP 1.1

Near the top of the program you will see a row of icons. The icon for the Zone Manager Loads module looks like this:

Click on the icon.

STEP 1.2

The Zone Manager Loads module is now open. It looks like this:



Zone Manager Module With No Open Zone

STEP 1.3

Click on the New Zone icon to add one zone to the design. The New Zone icon looks like:

and can be found at the top of the module. A new zone with all parameters set to zero is now open.

STEP 1.4

We are now ready to import loads data from the GeoXergy Plug-In. The data in the GeoXergy Plug-In should look something like this:

	Cooling	Heating
Peak (kBtu)		
Annual Running Time		

Highlight the peak and annual running time data in the Plug-In and copy them to the clipboard. Be sure to copy only the data and not the surrounding data descriptions.

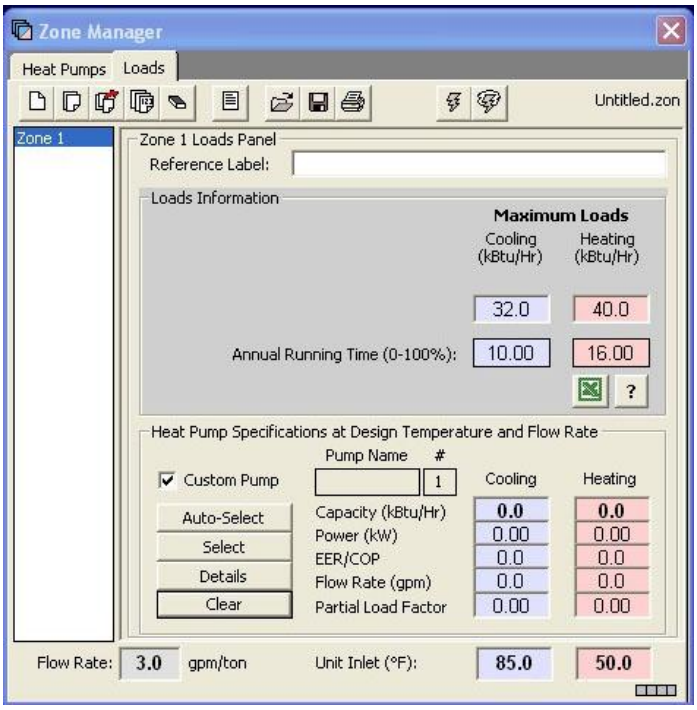
Confirm that GLD is in the units format (metric/English) that matches your loads data before you import. You can convert between the two formats via this button:

It can be found at the top of the GLD program at the very right end of the row of icons.

STEP 2.5

Click the Excel button in the Zone Manager Loads module. It looks like this:

The loads data is now in GLD and it should look like this:



Zone Manager Loads Module With Imported Data

demo continues on page 9

If you will be manually entering the loads data and need more information about the annual running time, click the *?* button in the Zone Manager.

How Do I Choose A Pump?

The Zone Manager Loads module offers three methods for selecting pumps:

- Automatic selection based on the active heat pump series
- Manual selection from a list of all available pumps

- Custom input of pump data

In this tutorial, we will have the program automatically select a heat pump from the active heat pump series. By active heat pump series we mean that the user first selects a heat pump manufacturer and pump family (the active series) and then the program auto selects a pump from the family to match the loads

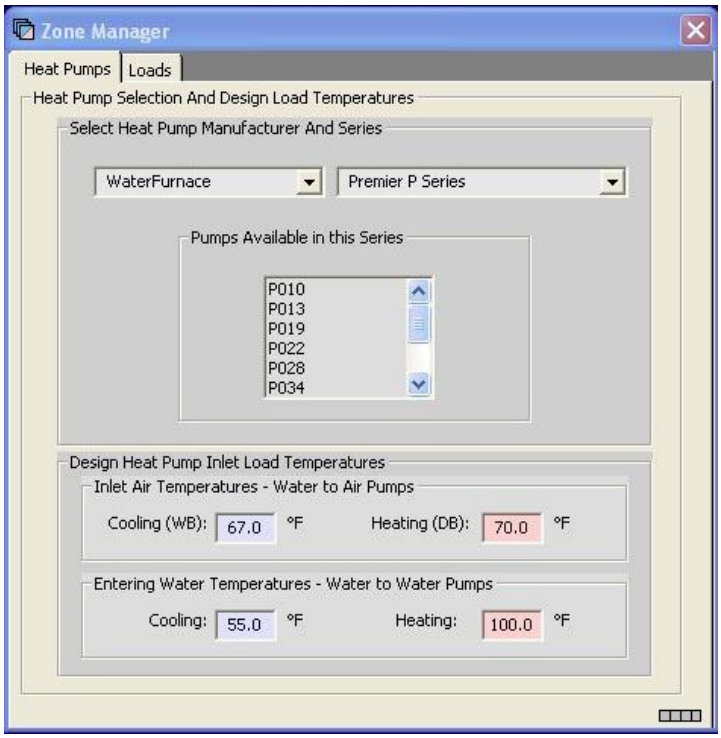
Automatic selection based on the active heat pump series

Step 2

STEP 2.0

First, select the active heat pump series by clicking on the HEAT PUMPS tabs as seen below:

When you do so, a screen similar to the one below will become visible:



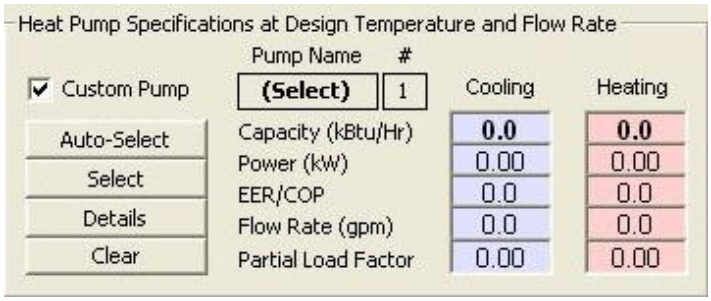
Heat Pump Series Selection

In this panel, you can select a manufacturer and heat pump family and view the pumps available in the family. **Note** that you cannot select individual heat pumps here. This list only indicates which pumps are available for auto-selection by the program. If you want to manually select a particular pump, keep reading.

In this example, select the: **Waterfurnace Premier P series**

STEP 2.1

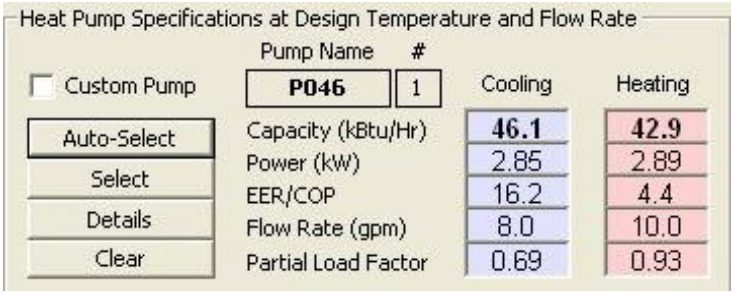
Return to the Loads tab and take a look at the heat pump data panel:



Prior to Selecting a Heat Pump

STEP 2.2

With no pump currently selected, the Custom Pump box is checked, and all pump performance values are at 0.0. To have the program auto select a pump from the Waterfurnace Premier P family, hit the *Auto-Select* button. This is what you will see:

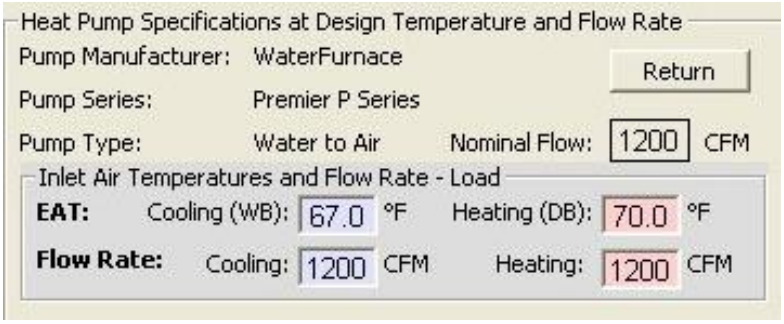


Selected Pump Performance Characteristics

The program has selected the PO46 pump based on the peak loads that we entered earlier in this tutorial.

STEP 2.3

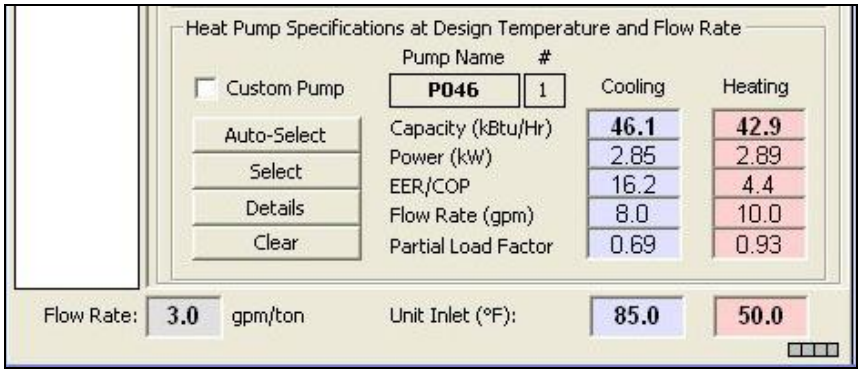
Click on the *Details* button to see details about the selected PO46 pump



Selected Pump Details

This screen displays details about the selected pump. It also displays the load side Entering Air Temperature (EAT) for both cooling and heating. GLD employs an accurate system for modeling heat pump performance. Both source and loads side factors affect heat pump performance and GLD models these factors. Users can modify the EAT as necessary for specific design applications. In this tutorial, the EAT values will not be modified.

Click the *Return* button to go back to the original view:



Selected Pump Performance Characteristics

Manual selection from a list of all available pumps

If an automatically selected heat pump is for any reason undesirable, or a different pump series from the same manufacturer or even from a different manufacturer is required, the *Select* button may be used. This button allows the designer to choose any of the database pumps. As with the *Auto-Select* button, all of the associated fields are calculated automatically once the pump is selected.

When the *Select* button is pressed, a selection panel appears. After a pump is chosen, pressing *Select Pump* will place the pump in the zone

and automatically calculate all of the associated parameters. *Cancel* will return the user to the main display without changing any pumps.

Note: Unlike with Auto-Select*, a pump that is manually selected may or may not match the loads in the zone. It is the responsibility of the designer to make sure the pumps match the loads and zones.*

Custom input of pump data

In addition, users can manually override any performance values by simply clicking in the appropriate dialog box and typing in a new value. If you do this, the "custom pump" box will become checked automatically to remind you that you have modified the standard data. Modifying the standard pump data is useful when you intend to use a customized pump.

STEP 2.4

Users now have the opportunity to modify system flow rates, unit inlet temperatures and pump performance parameters, Note that when we design the vertical borehole heat exchanger in the next chapter, you will have the opportunity to modify the flow rate and unit inlet temperatures. For the time being, use the following values:

- Flow Rate: **3.0 gpm/ton**
- Cooling Inlet Temp: **85^{0}F**
- Heating Inlet Temp: **50^{0}F**

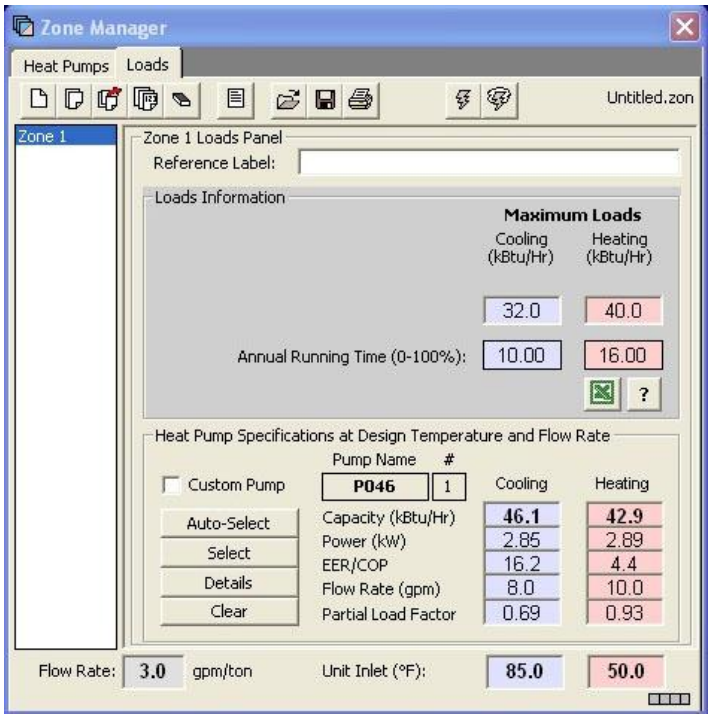
Note that if you want to use metric units, just click on the English/Metric units conversion button:

It can be found at the top of the GLD program at the very right end of the row of icons.

STEP 2.5

Now save the loads data. Click on the floppy disk icon at the top of the Zone Manager Loads module. Save the file in Program Files/Gaia Geothermal/Ground Loop Design/Zones as **Demo.zon**.

Summary: We have imported loads data into the Zone Manager Loads module and selected a pump. This is what your Zone Manager Loads module should look like:



Zone Manager Loads Module: Ready for Heat Exchanger Design

demo continues on page 14

Chapter 3

Heat Exchanger Design

Ground Loop Design includes vertical, horizontal and surface water heat exchanger design modules. As you continue with the vertical heat exchanger design, you will begin to see how the modular nature of GLD offers so much flexibility. Although each module is stand-alone and independent, the modules communicate and share data with each other via the Studio Link system.

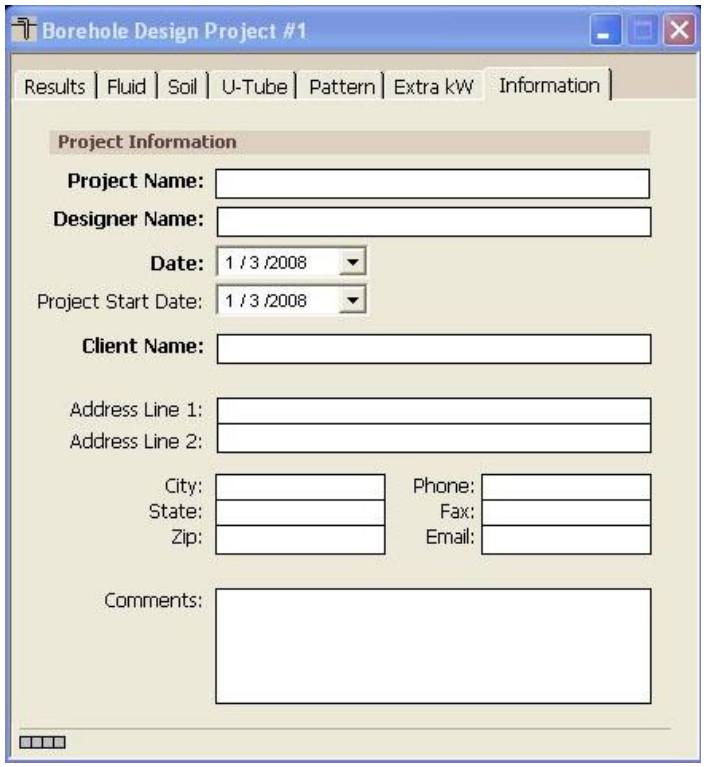
What Is the Studio Link System?

STEP 3

The best way to describe the Studio Link system is to demonstrate it. Please open a new Vertical Borehole Design module. You can do this by clicking on the Vertical Borehole icon. It is the first icon to be found in the top left corner of GLD and looks like this:

STEP 3.0

When you click it, a new window will open in GLD. This is the Vertical Borehole Design window (or module). It looks like this:

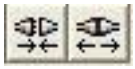


New Vertical Borehole Design Module

STEP 3.1

We first have to connect the data we entered in the Zone Manager Loads module to the Borehole Design module. The Studio Link system will help us do this.

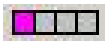
At the top of GLD look for the following two icons:



link unlink

STEP 3.2

The icon on the left is the link icon and the icon on the right is the unlink icon. Click on the link icon and see what happens. Notice in the bottom left corner of both modules (the Borehole module and the Loads module) that there is a lighted box. It looks like this (the color may vary):



This box indicates that the two modules are linked and have bidirectional communication.

STEP 3.3

Now click the unlink icon. You will notice that the position and color of the light has changed, indicating that the two modules are no longer communicating. It looks like this:

STEP 3.4

Push the link button again to reestablish communications.

Step 4

Now That My Loads Data Are Linked To The Borehole Designer, How Do I Start Designing?

The Borehole Design module allows the user to enter various parameters with respect to the desired vertical borehole system using a tabbed series of panels as seen below:

Borehole Design Panel List

STEP 4.0

Click on the Information tab to open the Information panel. Any information you type in this panel will be included in printable reports.

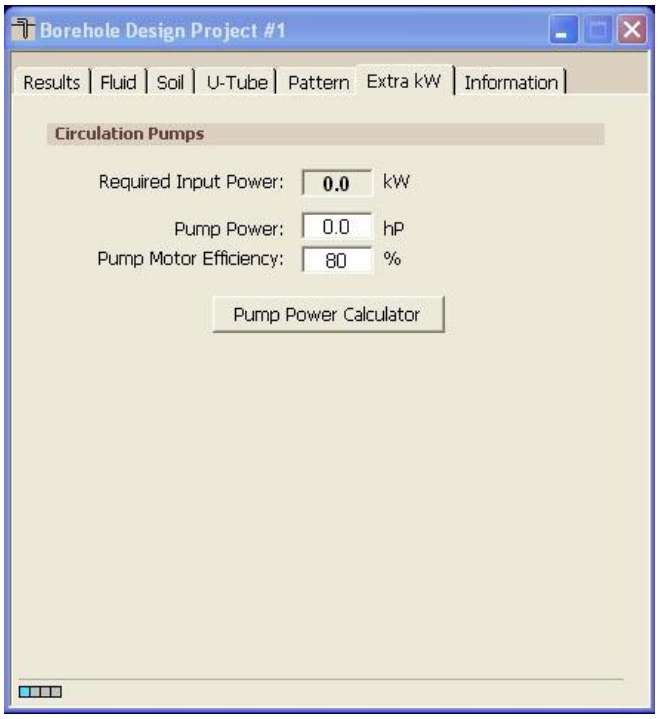
STEP 4.1

In the Information panel, please enter the following data:

- project name: **Gaia Headquarters**
- client name: **Your Choice**
- address: **Your Choice**

STEP 4.2

Now click on the Extra kW panel that is directly to the left of the Information Panel. This is what you will see:



Extra kW panel

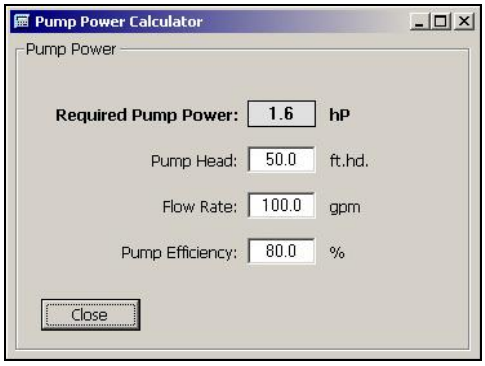
The entry box, "Circulation Pumps", is for the energy required by the system circulation pumps.

Note: To make a kilowatt entry in the 'Pump Power' box, switch to metric units, enter the kilowatt value, and then return to English units. You can do this by clicking on the metric/English units conversion button:

This button can be found near the top of the program at the far right end of the row of icons.

Pump Power Calculator

Click on the Pump Power Calculator button to open the calculator. It looks like this:



Pump Power Calculator

If the pump efficiency, system flow rate and head loss are known, the *Pump Power Calculator* can be used to determine the pump power. Click on the Close button.

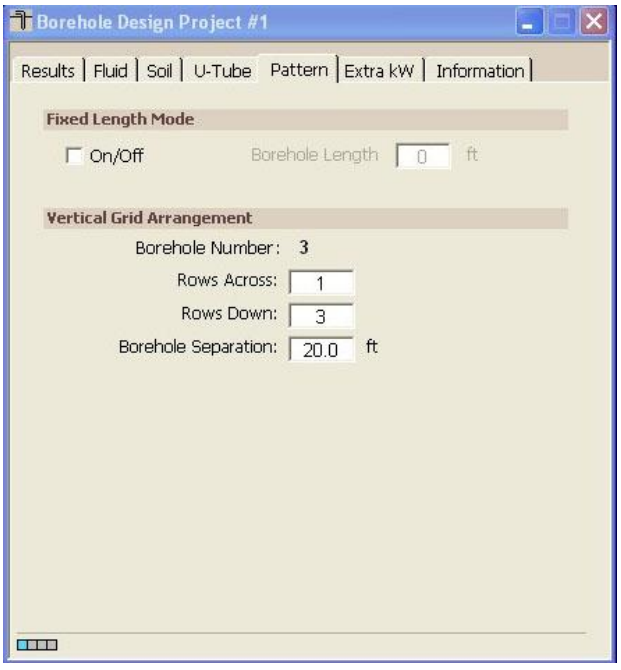
STEP 4.3

For this demo, we will input the following values in the Extra kW Panel:

- Pump Power: **1hp**
- Pump Motor Efficiency: **85%**

STEP 4.4

Now click on the Pattern tab. This is what you will see:



Pattern Panel

Information pertaining to the ground field arrangement is in the Pattern panel. This includes the fixed borehole length design option, the vertical boreholes pattern and the borehole separation. See the full user manual for information about the fixed borehole length design option.

Note: The separation between vertical bores value is the center-to-center distance between adjacent bores.

STEP 4.5

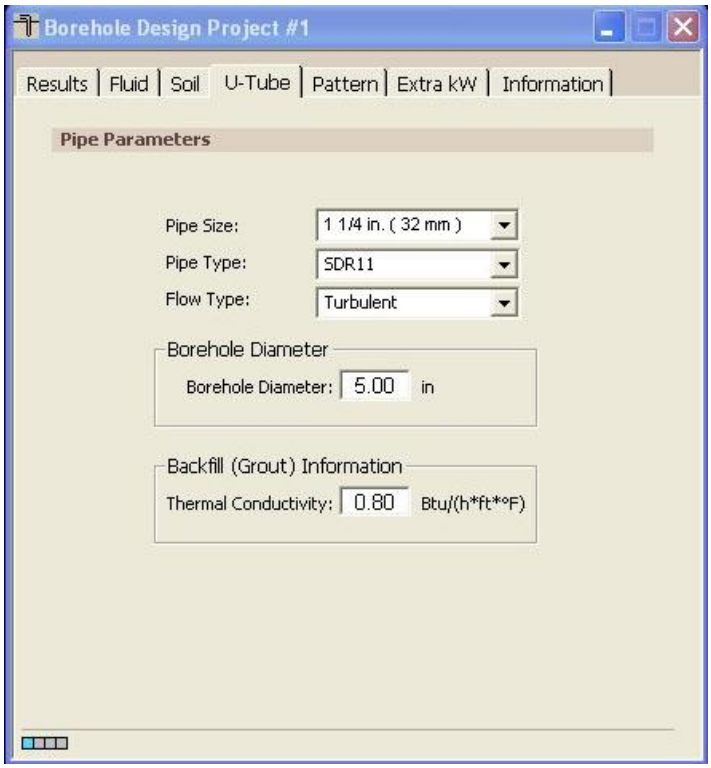
For this demo project, input the following values:

- Fixed Length Mode **Off**
- Number of Rows Across: **1**
- Number of Rows Down: **3**
- Borehole Separation: **20 ft**

After we finish our initial design and determine what our total pipe and drilling requirements are, we will be able to modify these input values if necessary.

STEP 4.6

Now click on the U-Tube tab. The screen will look like this:



U-Tube Information

The U-Tube panel contains information related to the pipe and bore. The main purpose of the panel is to obtain a value for the borehole thermal resistance.

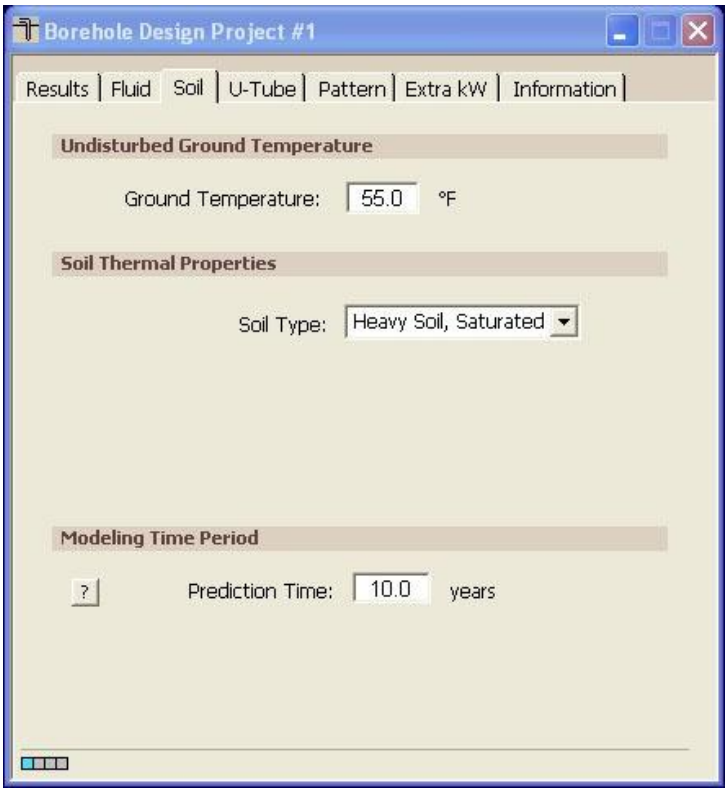
STEP 4.7

In this demo, input the following values:

- Pipe Size: **1 1/4 in**
- Pipe Type: **SDR11**
- Flow Type: **Turbulent**
- Borehole Diameter: **5.00 in**
- Grout Thermal Conductivity: **0.80**

STEP 4.8

Now click on the Soil tabbed panel. You should see the following screen:



Soil Panel

Input parameters relating to the soil are located in the Soil panel, as shown above. These include the average ground temperature and the soil type. See the User Manual for the thermal conductivity and thermal diffusivity values associated with each listed soil type. Since

thermal conductivity has a particularly large effect on the bore length calculations the soil type should be determined with care through *in-situ* tests or comparisons with other projects installed in the local vicinity. In addition, the modeling time period can be modified here.

Note: For the modeling time period, ten years is used as a standard length of time for the ground temperature to stabilize, although other time periods may be entered if desired. For more information, click the *?* Button on the Soil panel.

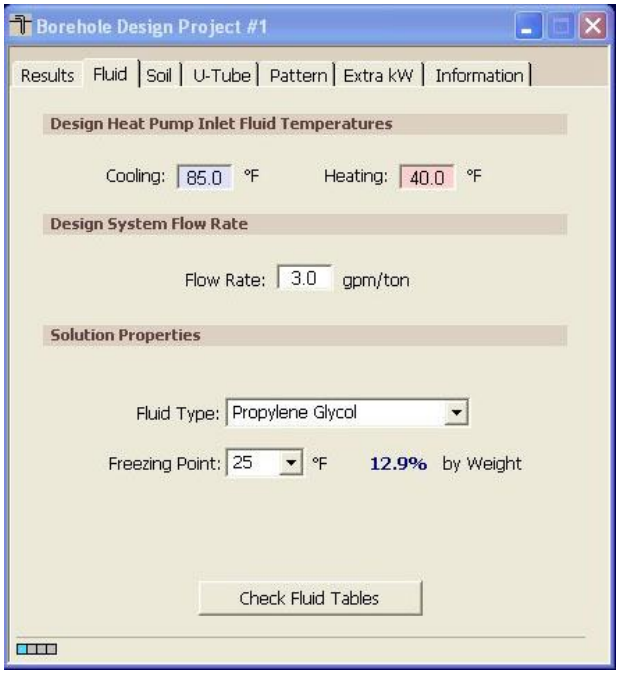
STEP 4.9

For this demo, input the following values into the Soil panel:

- Ground Temperature: **55^0F**
- Soil Type: **Heavy Soil, Saturated**
- Prediction Time: **10 years**

STEP 4.10

Now we are ready for the Fluid panel. Please click on the Fluid tab. Your screen will look like this:



Fluid Panel

The circulating fluid parameters may be entered in the *Fluid* panel.

Note: The system flow rate per installed ton is included on the *Fluid* panel. *This is the system flow rate per ton of peak load, not installed capacity* (This is because it is assumed that all units will not be running at full load simultaneously, even in the peak load condition).

Note: GLD is a modular program meaning that the program consists of several modules that work together to assist you with your designs. The fluids panel offers one of the most obvious examples of how the different modules communicate with one another. Take a look at the Zone Manager Loads module once again. Notice that the flow rate and the unit inlet temperatures at the bottom of the Zone Manager Loads Module match those of the Fluids panel.

Change the cooling inlet temperature in the Fluids panel to 90^{o}F. Then, click your mouse pointer anywhere inside the Zone Manager Loads Module. The Zone Manager Loads module cooling inlet temperature automatically updates itself along with the pump performance characteristics. This connectivity saves designers much time. While this feature is a tremendous time-saver, the n**ew calculated equipment capacities can lead to changes in selected equipment so the designer must be aware of the changes**. Customized pump values must be manually adjusted.

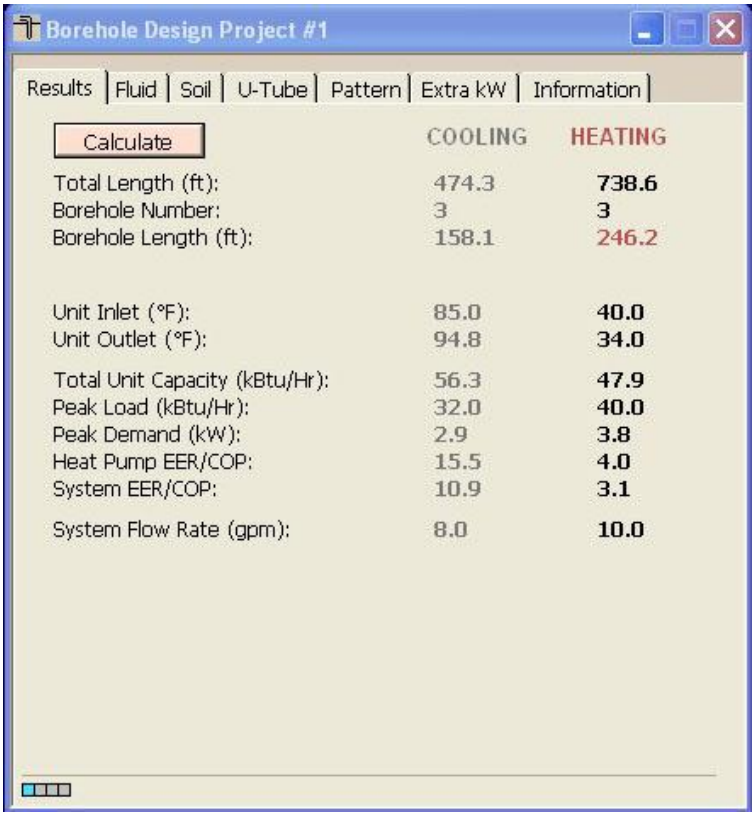
STEP 4.11

For this demo, input the following values into the Fluid panel:

- Cooling Inlet Temperature: **80^{o}F**
- Heating Inlet Temperature: **40^{0}F**
- Fluid Type: **Propylene Glycol**
- Freezing Point: **25^{0} F**

STEP 4.12

We are now ready to perform our initial calculation. Navigate to the Results panel and click on the *Calculate* button. Your screen should look something like this:



The Initial Calculation

The two columns on the Results panel are for heating and cooling. Although all of the numbers shown are valid and respond to changes, the side with the longer required length is printed in bold type so that it stands out.

STEP 4.13

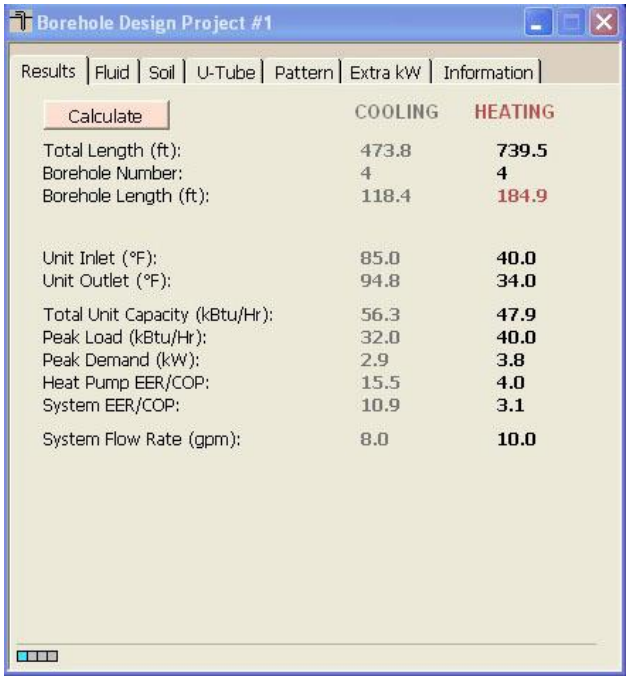
In this demo, the heat exchanger is heating dominated (as expected from the loads data). Notice that there are 3 boreholes (in the Pattern panel we specified a 1 x 3 grid arrangement) and that each borehole is about 246 feet long. We now will quickly optimize the design.

In this demo we do not want to drill deeper than 200 feet. Change the grid arrangement on the Pattern tab:

- Number of Rows Down: **1**
- Number of Rows Down: **4**
- Separation Between Boreholes: **20 ft**

STEP 4.14

Click on the *Calculate* button again. The individual borehole length has dropped to about 185 feet.



Optimized Design Results

demo continues on page 25

Summary: In this chapter, we learned how to link the loads and heat exchanger modules, how to input heat exchanger design parameters and how to optimize a design by modifying parameters. GLD also contains Horizontal and Surface Water Design modules (explained in Chapters 5 and 6 in the User Manual) which you can use in the same way as the Vertical Borehole module. In the next chapter we will show you how to print reports and email project files as well as how to begin taking advantage of some of the more powerful GLD features.

Chapter 4

Reports And Design Tips

Whether you have finished your design and want to send customized reports to vendors, clients and colleagues or need to collaborate on a design with a coworker halfway around the world, GLD offers a variety of communication tools to help you work effectively. In this final chapter, we will show you how to choose and print reports, how to email project files so that colleagues can review, modify or approve designs, and how to take advantage of a few of the many other features that GLD offers.

Reports

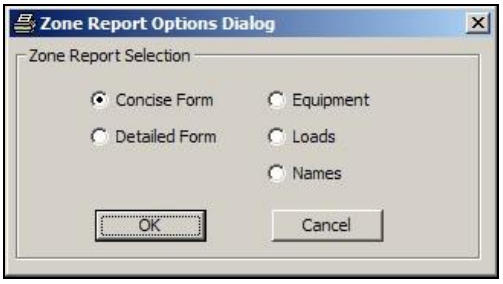
At any step in the design process, you can choose to print out a variety of reports including five types of loads/zone reports and one type of heat exchanger report.

Step 5

STEP 5.0

Zone Reports

You should still have the Zone Manager Loads module open. At the top of the module you will see a print icon. Click on it and a dialog box will open that looks like this:



Loads Report Choices

Zone (or loads) reports include only the project information and data from the zones. Five different zone reports exist, containing complete or specific information about the zones. Zone reports are representative of the actual installation rather than the heat exchanger portion of the system. There five different zone report choices include:

- **Concise Form:** Contains important info about loads and operational parameters of equipment
- **Detailed Form:** Contains all info for every zone and a full explanation of the listed parameters
- **Equipment List:** Contains the equipment for each zone. This report is ideal for engineers or contractors who require only equipment details
- **Loads List:** Contains the loads at different times in the day for each zone.
- **Names List:** Contains the full reference names of every zone, the zone number and pump information. This report is useful for when a project has many zones

STEP 5.1

Explore the different reports and print one out. Notice that the project information you entered in the Information panel of the Borehole Design module appears in all the reports.

Step 6

Project Reports

STEP 6.0

Now look at the row of icons at the top of the GLD program. Find the print icon and press it (if you cannot click on the print icon, first click the mouse within the Borehole Design module window). You will have the option of printing a **Concise Form**

STEP 6.1

Choose to print the concise form and take a look at it.

Sharing Project Files With Colleagues

GLD saves **zone** files (from the Loads modules) and **project** files (from the heat exchanger files) separately. Colleagues that use GLD can receive these files as email attachments and view/modify the project designs and/or the loads data. Below is a brief description of the two types of files.

Zone Files

Zone (loads) files are stored as ***.zon** files in the Ground Loop Design '**zones'** directory. They have a general format that can be read into any loads module, and they **can be used simultaneously** in different design modules.

Project Files

GLD saves project files as *.gld files in the Ground Loop Design '**work files'** directory. Each project file type (vertical borehole, horizontal, surface water) has a specific format that GLD automatically recognizes.

Sharing Files

GLD expects to find the files in the following folders:

Zone files: Program Files/Gaia Geothermal/Ground Loop Design/Zones

Project Files: Program Files/Gaia Geothermal/Ground Loop Design/Work Files

When you send or receive files, confirm that the files are in the appropriate directories before trying to open them within the program.

Note: GLD is available in foreign languages (contact your distributor for more information). If you are working with clients or coworkers in other countries, you can just email your files to them and they will be able to read the files in their native language. Geoexchange designs can be complex. In our increasingly interconnected world, you can use GLD to minimize the risk of communication problems while working in multiple languages.

Design Tips

Congratulations! You now know enough about GLD to begin designing world-class projects with efficiency and ease. Below you will find a list of suggestions for further exploration and design success:

1. **After** inputting loads and selecting pumps in a loads module, open up two new heat exchanger design modules. Click on one design module to activate it and then click on the link button. Then, click on the other design module to activate it and once again click on the link button. Now, both design modules are

linked to the same loads data. Now you can compare two designs at the same time.

2. **If** you have data in only metric units, but want to work in English units (or vice versa), click the English/metric units conversion button. Enter the data in the units you have and when you are done, click the conversion button again. Now all your data is in the format with which you want to work. You can also print out reports in different units following the same procedure.

3. **Compare** and contrast different manufacturers and heat pumps. Finish a complete design, print out a report, and then change which manufacturer(s)/pump(s) you are using. Print out another report and compare.

4. **In** the Zone Manager Loads module there is a summary view button that allows users to quickly look at all the zone data simultaneously. The summary button looks like this:

and can be found in the middle of the row of icons at the top of the Zone Manager. This is useful when you want to quickly review all the work you have done on a multi-zone installation.

5. **GLD** comes complete with a full set of reference files including Fluid Properties, Soil Properties, Pipe Properties and Unit Conversions. These files can be accessed from the Tables dropdown menu found at the top of GLD. These files are HTML-based and can be modified, customized or added to by the user using a text editor or HTML editor. More information about customizing these files can be found in Chapter 7 of the User Manual.

6. **GLD** contains a searchable database of information about the program. Click on the Help dropdown menu and choose help.

Concluding Remarks

If you have questions about or suggestions for the program, please contact your distributor. Do you need a particular design feature that GLD does not currently offer? Let us know and we will do our best to include it in future versions. Thank you for choosing Ground Loop Design.